Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (previously presented) A method of measuring a three dimensional shape of a fine pattern formed on a substrate, comprising the steps of:

obtaining height information about the fine pattern by optically measuring the substrate;

obtaining electron beam image information about the fine pattern by imaging the substrate by means of an electron microscope; and

measuring the three dimensional shape of the fine pattern by use of the height information and the electron beam image information;

wherein the electron beam image information includes information of average slope angle of a side wall of the fine pattern, information of a ratio of bottom roundness of the fine pattern and information of a ratio of top roundness of the fine pattern which are quantified by using information of a first-order differential waveform.

2. (original) The method of claim 1, wherein a test pattern is formed on the substrate, and the height information about the fine pattern is obtained from height information about the test pattern determined by optically measuring the test pattern.

3. (previously presented) The method of claim 1, wherein the height information about the fine pattern is obtained from information obtained from scatterometry.

4. (original) The method of claim 1, wherein the electron beam image information about the fine pattern includes plane information about the fine pattern and side slope change information about the fine pattern, and a three dimensional shape of the fine pattern is measured by combining the plane information and side slope change information with the height information about the fine pattern.

5. (currently amended) The method of claim 1, wherein ~~the electron beam image information about the fine pattern includes a plurality of electron beam image information obtained by imaging the substrate by changing the incidence angle of an electron beam of the electron microscope relative to the substrate~~ the information of average slope angle of a sidewall of the fine pattern which is quantified by using information of the first-order differential waveform of a signal detected by the electron microscope of an average slope angle $\tan^{-1}$ (H/E), where H is a height when a cross section is considered as a trapezoid and E is a width between a top and bottom of the slope when viewed from above the fine pattern, the information of the ratio of bottom roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the bottom roundness B/H, where B is the width between a rising point corresponding to a bottom and a maximum point, and the information of the ratio of top roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the top roundness T/H, where T is a distance between a minimum point and a starting point of a flat portion corresponding to the top of the electron beam image signal.

6. (previously presented) The method of claim 1, wherein the electron microscope comprises a plurality of reflected electron detectors, the electron beam image information about the fine pattern is information obtained from a plurality of electron beam images detected by the plurality of reflected electron detectors.

7. (previously presented) The method of claim 6, wherein a three dimensional shape of the fine pattern is measured on the principle of photometric stereo processing by use of a plurality of the electron beam images detected by the plurality of reflected electron detectors.

8. (previously presented) A method of measuring a three dimensional shape of a fine pattern formed on a substrate, the pattern being in a form of a thin film, comprising the steps of:

obtaining height information about a first pattern by measuring, using scatterometry, the first pattern being repeatedly formed by a predetermined pitch;

obtaining electron beam image information about a second pattern by imaging, using an electron microscope, the second pattern being formed on the substrate; and

measuring a three dimensional shape of the second pattern by use of the height information about the first pattern and the electron beam image information about the second pattern;

wherein the electron beam image information includes information of average slope angle of a side wall of the second pattern, information of a ratio of bottom roundness of the second pattern and information of a ratio of top roundness of the second pattern which are quantified by using information of a first-order differential waveform.

9. (original) The method of claim 8, wherein a height of the second pattern is estimated from the height information about the first pattern, and the estimated height information about the second pattern and the electron beam image information about the second pattern are used to measure a three dimensional shape of the second pattern.

10. (currently amended) The method of claim 8, wherein ~~the electron beam image information about the second pattern includes plane information about the second pattern and side slope change information about the first pattern, the plane information and the side slope change information are combined to measure a three dimensional shape of the second pattern~~ the information of average slope angle of a sidewall of the fine pattern which is quantified by using information of a first-order differential waveform of a signal detected by the electron microscope of an average slope angle $\tan^{-1}$ (H/E), where H is a height when a cross section is considered as a trapezoid and E is a width between a top and bottom of the slope when viewed from above the the pattern, the information of the ratio of bottom roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the bottom roundness B/H, where B is the width between a rising point corresponding to a bottom and a maximum point, and the information of the ratio of top roundness of the fine pattern is quantified by using information of a first-order differential waveform of the ratio of the top roundness T/H, where T is a distance between a minimum point and a starting point of a flat portion corresponding to the top of the electron beam image signal.

11. (previously presented) A method of measuring a three dimensional shape of a fine pattern formed on a substrate, comprising the steps of:

obtaining optical information about a fine pattern formed on the substrate by optically measuring the substrate;

obtaining a plurality of electron beam image information about the fine pattern formed on the substrate by imaging the substrate by means of an electron microscope;

measuring a three dimensional shape of the fine pattern by use of the obtained optical information about the fine pattern and the obtained plurality of electron beam image information; and

displaying, on a screen, information about the measured three dimensional shape of the fine pattern and a plurality of electron beam images of the fine pattern;

wherein in the step of measuring, the electron beam image information includes information of average slope angle of a side wall of the fine pattern, information of a ratio of bottom roundness of the fine pattern and information of a ratio of top roundness of the fine pattern which are quantified by using information of a first-order differential waveform.

12. (previously presented) The method of claim 11, wherein a waveform of a combination of a plurality of scanning line signals of one of the plurality of electron beam images of the fine pattern is displayed on the screen.

13. (previously presented) The method of claim 11, wherein the information obtained by optically measuring the substrate is information obtained by measuring a test pattern, formed on the substrate, by means of scatterometry.

14. (currently amended) The method of claim 11, wherein ~~the electron beam image information obtained by imaging the substrate by means of the electron microscope is information obtained from a plurality of electron beam images imaged by changing an incidence angle of an electron beam of the electron microscope relative to the substrate~~ the information of average slope angle of a sidewall of the fine pattern which is quantified by using information of the first-order differential waveform of a signal detected by the electron microscope of an average slope angle $\tan^{-1}$ (H/E), where H is a height when a cross section is considered as a trapezoid and E is a width between a top and bottom of the slope when viewed from above the fine pattern, the information of the ratio of bottom roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the bottom roundness B/H, where B is the width between a rising point corresponding to a bottom and a maximum point, and the information of the ratio of

top roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the top roundness T/H, where T is a distance between a minimum point and a starting point of a flat portion corresponding to the top of the electron beam image signal.

15. (original) The method of claim 11, wherein the electron beam image information obtained by imaging the substrate by means of the electron microscope is information obtained from a plurality of electron beam images detected by a plurality of reflected electron detectors equipped in the electron microscope.

16. (previously presented) An apparatus for measuring a three dimensional shape of a fine pattern formed on a substrate, comprising:

input means which input data obtained from a scatterometry by measuring a first pattern repeatedly formed on a substrate and an electron beam image data of a second pattern finely formed the substrate obtained by an electron microscope;

processing means which processes the data obtained from the scatterometry and the electron microscope input by the input means to obtain a three dimensional shape of the second pattern; and

output means which output data processed by the processing means through a communication line;

wherein the processing means processes the data obtained from the electron microscope by extracting information from the electron beam image data including information of average slope angle of a side wall of the second pattern, information of a ratio of bottom roundness of the second pattern and information of a ratio of top roundness of the second pattern which are quantified by using information of a first-order differential waveform.

17. (currently amended) An apparatus according to claim 16, wherein ~~said~~ the output means outputs said data to a recipe server through a communication line,

and wherein the processing means extracts the information including the information of average slope angle of a sidewall of the fine pattern which is quantified by using information of the first-order differential waveform of a signal detected by the electron microscope of an average slope angle $\tan^{-1}$ (H/E), where H is a height when a cross section is considered as a trapezoid and E is a width between a top and bottom of the slope when viewed from above the fine pattern, the information of the ratio of bottom roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the bottom roundness B/H, where B is the width between a rising point corresponding to a bottom and a maximum point, and the information of the ratio of top roundness of the fine pattern is quantified by using information of the first-order differential waveform of the ratio of the top roundness T/H, where T is a distance between a minimum point and a starting point of a flat portion corresponding to the top of the electron beam image signal.

18. (currently amended) An apparatus according to claim 16, further comprising a display ~~mans~~ means which displays an electron beam image input through the input means together with an image of the three dimensional shape of the second pattern obtained by the processing means and a list of information of the three dimensional shape of the second pattern.